#32 Appeal Brief 12/14/01 K Daniels

Express Mail Label No. EL872216860US

PATENT
Attorney Docket No. MLB-038

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT(S):	Christopher Turner et al.		
SERIAL NO.:	08/820,057	GROUP NO.:	2673
FILING DATE:	March 18, 1997	EXAMINER:	David Lewis
TITLE:	PRINTABLE ELECTRONIC DISPLAY		

Commissioner for Patents
Washington, D.C. 20231

BRIEF ON APPEAL

REAL PARTY IN INTEREST

The real party in interest is the Massachusetts Institute of Technology, the owner of the present application.

RELATED APPEALS AND INTERFERENCES

No other appeals or interferences directly affect or will be directly affected by the Board's decision in the present appeal.

STATUS OF CLAIMS

The application as filed contained 45 claims, which were made subject to a restriction requirement. Applicants elected claims 1-34 for prosecution, and subsequently canceled claim 29 in the amendment filed on February 15, 2000. Accordingly, claims 1-28 and 30-34 remain pending and subject to the present appeal.

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Office Action mailed on June 15, 2001.

SUMMARY OF INVENTION

The present invention involves electronically addressable displays that may be fabricated using printing techniques.[1] In particular, printing processes can be used to deposit the electrodes, insulating material, the display itself, and an array of nonlinear devices to facilitate addressing.[2] Accordingly, fabrication of the displays of the present invention may be accomplished at significantly lower cost and with far less complexity than would obtain using other fabrication technologies.

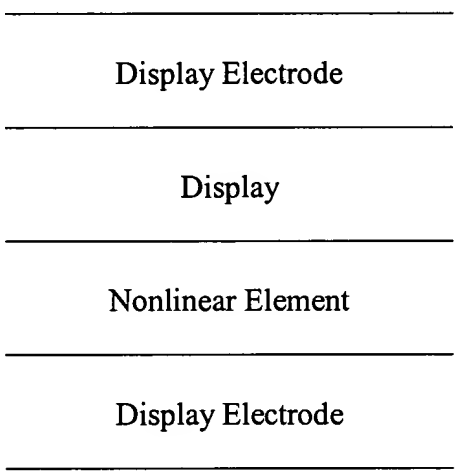
As set forth in the claims, a display in accordance with the present invention comprises a first set of display electrodes associated with a first layer; a second set of display electrodes associated with a second layer distinct from the first layer and disposed in an

[1] Specification at page 5, lines 6-7.
[2] See FIGS. 1, 4A-4D.

intersecting pattern with respect to the first set of electrodes, the first and second sets of electrodes not contacting one another; a particle-based, nonemissive display; and a plurality of nonlinear elements.[3]

The display and the nonlinear elements are sandwiched between the first and second display electrode layers so as to electrically couple at least some electrodes of the first layer with corresponding electrodes of the second layer at regions of intersection.

Accordingly, the present claims recite a structure (seen in truncated end view) as follows:



The purpose of this construction is to allow the nonlinear element to govern switching of the display. Unless both intersecting electrodes sandwiching a display element are energized, the voltage across the nonlinear element will not exceed the element's threshold, so very little current will flow between the electrodes; as a result, the

[3] See, e.g., FIG. 4B.

display will not be activated inappropriately. It is for this reason that the claims require the display and nonlinear elements to *electrically couple* the electrodes—i.e., they are *in series*.[4]

ISSUES

The issue on appeal whether claims 1-28 and 30-34 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 5,220,316 to Kazan ("Kazan") in view of U.S. Patent No. 5,216,530 to Pearlman et al. ("Pearlman") and U.S. Patent No. 4,741,601 to Saito ("Saito") or U.S. Patent No. 5,042,917 to Fujita et al. ("Fujita").

GROUPING OF CLAIMS

Applicant believes that the claims stand or fall together.

ARGUMENT

I. The Cited References, Considered Separately or Together, Do Not Render the Present Claims Unpatentable

As explained above, the present claims require the display and nonlinear elements to be *sandwiched between* the first and second electrode layers. Moreover, the first and second electrode layers form an intersecting pattern, and the sandwiched display and nonlinear elements must *electrically couple* electrodes of the first and second layers where they intersect. These features are nowhere disclosed or suggested in the cited art.

[4] Specification at page 12, lines 4-5.

A. *The Kazan Reference*

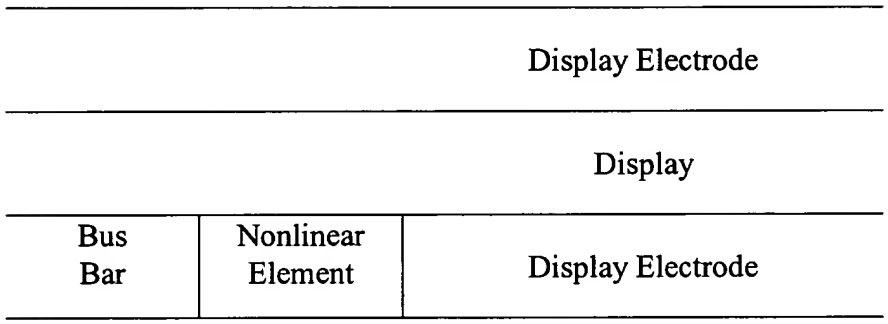
The Examiner expressly concedes that "Kazan does not teach ... the display and the nonlinear elements being sandwiched between the first and second electrode layers so as to electrically couple at least some of the electrodes of the first layer with corresponding electrodes of the second layer at regions of intersection." Office Action mailed on June 15, 2001 (hereafter the "6/15/01 Office Action") at 3.

The Examiner therefore relies on Saito or Fujita to supply what Kazan lacks. In particular, the Examiner states that "Saito or Fujita et al. teaches ... a non-linear device for driving a liquid crystal display, wherein the non-linear device is sandwiched between two electrode layers, as fabricated by conventional semiconductor techniques." 6/15/01 Office Action at 7.

For the reasons that follow, we respectfully submit that neither Saito nor Fujita stands for the proposition cited.

B. *The Saito Reference*

The Saito patent does not show a nonlinear device sandwiched between the two electrodes of a display as required by the present claims. Instead, the relevant portions of Saito's construction are as follows:



Thus, the nonlinear element is *not* sandwiched between display electrodes. Instead, the nonlinear element is located *beneath* one of the display electrodes rather than between them. Accordingly, the nonlinear element cannot *electrically couple* the display electrodes as required by the present claims.

In particular, as shown in Figs. 3 and 4 and as set forth in col. 2, line 62 to col. 4, line 20, Saito contemplates a nonlinear device residing between a signal line 31 carrying synchronizing pulse signals and *one display electrode*. The display is sandwiched between display electrodes *but the nonlinear device is outside the sandwich.*

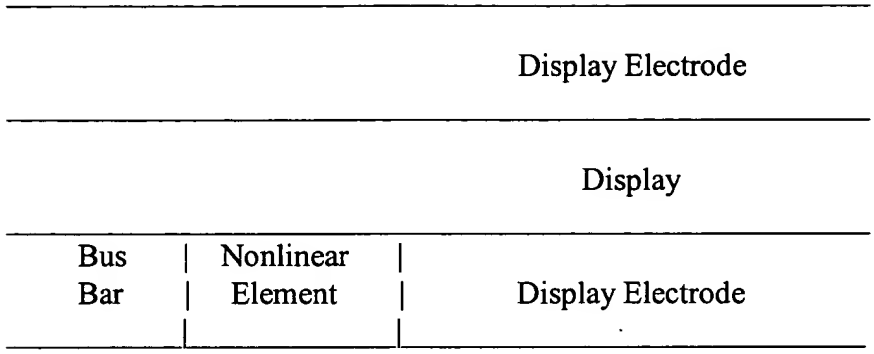
At col. 4, lines 12-20, the patentees state:

> The elongated portions of the electrodes 15-1 and 15-2 thus function as **one electrode of each liquid crystal display cell**. Although not shown, a liquid crystal is coated over the entire surface, and a glass board is disposed on the coated liquid crystal layer. The data lines 32 (see FIG. 2) ... are formed on the glass board in a column direction. Each of data lines 32 also operates as the other electrode of each liquid crystal display cell 33. (Emphasis added.)

It should be stressed that the location of Saito's nonlinear elements outside rather than between the display electrodes is not merely a design choice. The nonlinear elements described by Saito are essentially opaque, and Saito's liquid-crystal display is transmissive; as a result, the area occupied by the nonlinear element is permanently dark and non-switchable. It is for this reason that Saito's nonlinear device is small in area relative to that of the display (as suggested, for example, in Fig. 4) and is located outside the electrode/display structure. If Saito's nonlinear elements were to be located between the display electrodes, as required by the present claims, the entire display area would be permanently dark—in other words, it would not be a display at all.

C. *The Fujita Reference*

Fujita also does not show a nonlinear device sandwiched between the two electrodes of a display. Instead, the relevant portions of the Fujita construction are as follows:



Once again, the nonlinear element is *not* sandwiched between display electrodes as required by the present claims, and does not *electrically couple* the display electrodes. Instead, the nonlinear element couples the *bus bar* to *one display electrode*. At col. 2, lines 13-16, Fujita specifies "an amorphous semiconductor layer which is formed between the [sic] each bus bar and each of the plurality of pixel electrodes so as to provide an electrical connection there-between."

While Fig. 11 shows a small portion of the nonlinear element extending over the lower display electrode (so that *this portion* of the nonlinear element is disposed between the lower display electrode and the display), the function of the nonlinear element 2 in Fujita is nonetheless to couple the bus bar to the lower display electrode—not, as in the present claims, to couple the lower display electrode to the upper display electrode.

Accordingly, the requirements of the present claims simply are not met and, just as importantly, the benefits of the present invention are not obtained. Once again, the purpose of the sandwiched nonlinear element in the present claims is to electrically cou-

ple the display electrodes in order to avoid spurious activation of the display. There is no need for electrodes in addition to the two display electrodes. This simple and easily fabricated construction contrasts with both Fujita (which requires a bus bar in addition to two display electrodes) and Saito (which requires a synchronization line in addition to two display electrodes).

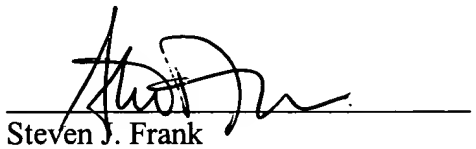
Moreover, in accordance with the present claims, the active elements are stacked one atop the other, rendering them amenable to convenient application by deposition. There is no need to establish electrical connections among different types of components *on the same layer*, as required by Fujita et al. (as well as by Kazan).

II. Conclusion

For all of the foregoing reasons, we submit that the Examiner's rejections of claims 1-28 and 30-34 were erroneous, and reversal thereof is respectfully requested.

Accompanying this brief is the fee specified in 37 C.F.R. §1.17(f). Please charge any additional fee occasioned by this paper to our Deposit Account No. 20-0531.

Respectfully submitted,



Date: November 14, 2001

Steven J. Frank
Reg. No. 33,497
Testa, Hurwitz & Thibeault, LLP
125 High Street
Boston, MA 02110-2704
(617) 310-8108
(617) 790-0353 fax

APPENDIX

1. A printable electronic display comprising:

a. a first set of display electrodes associated with a first layer;

b. a second set of display electrodes associated with a second layer distinct from the first layer and disposed in an intersecting pattern with respect to the first set of electrodes, the first and second sets of electrodes not contacting one another;

c. a particle-based, nonemissive display; and

d. a plurality of nonlinear elements,

the display and the nonlinear elements being sandwiched between the first and second display electrode layers so as to electrically couple at least some electrodes of the first layer with corresponding electrodes of the second layer at regions of intersection and thereby facilitate actuation of the display by the electrodes at said regions.

2. The display system of claim 1 wherein the nonemissive display is an electrophoretic display.

3. The display system of claim 1 wherein the nonemissive display is a rotating-ball display.

4. The display system of claim 1 wherein the nonemissive display is an electrostatic display.

5. The display system of claim 1 further comprising a thin, flexible substrate.

6. The display system of claim 1 wherein the first and second sets of electrodes are each arranged in a planar configuration, the electrodes of the first set being orthogonal to the electrodes of the second set.

7. The display system of claim 6 wherein the electrophoretic display material and the nonlinear elements are arranged in planar form and sandwiched between the first and second sets of electrodes.

8. The display system of claim 1 wherein the electrophoretic display comprises a plurality of discrete, microencapsulated electrophoretic display elements.

9. The display system of claim 8 wherein the electrophoretic display comprises:

a. an arrangement of discrete microscopic containers, each container being no longer than 500 μm along any dimension thereof; and

b. within each container, a dielectric fluid and a suspension therein of particles exhibiting surface charges, the fluid and the particles contrasting visually, the particles migrating toward one of the sets of electrodes in response to a potential difference therebetween.

10. The display system of claim 1 wherein the first and second sets of electrodes are printable, at least one of the sets of electrodes being visually transparent.

11. The display system of claim 1 wherein the nonlinear elements are printable.

12. The display system of claim 1 wherein the electrophoretic display is printable.

13. The display system of claim 11 wherein the nonlinear elements are a print-deposited ink exhibiting a nonlinear electrical characteristic.

14. The display system of claim 13 wherein the ink comprises:

a. a binder for printing; and

b. ZnO particles doped with at least one compound selected from the group consisting of sintered ZnO, Sb_2O_3, MnO, MnO_2, Co_2O_3, CoO, Bi_2O_3 and Cr_2O_3.

15. The display system of claim 14 wherein the binder comprises ethyl cellulose and butyl carbitol.

16. The display system of claim 15 wherein the binder further comprises a glass frit.

17. The display system of claim 15 wherein the binder comprises an epoxy resin.

18. The display system of claim 15 wherein the binder comprises a photohardenable resin.

19. The display system of claim 13 wherein the ink comprises:

a. a binder for printing; and

b. a doped, particulate silicon.

20. The display system of claim 19 wherein the binder comprises ethyl cellulose and butyl carbitol.

21. The display system of claim 19 wherein the binder further comprises a glass frit.

22. The display system of claim 19 wherein the binder comprises an epoxy resin.

23. The display system of claim 19 wherein the binder comprises a photohardenable resin.

24. The display system of claim 1 wherein the electrodes comprise a print-deposited conductive ink.

25. The display system of claim 19 wherein the electrodes comprise a print-deposited conductive ink providing a rectifying contact to the silicon.

26. The display system of claim 24 wherein the ink is transparent.

27. The display system of claim 24 wherein the ink comprises indium tin oxide.

28. The display system of claim 1 wherein each set of electrodes is arranged in lanes with spaces therebetween, and further comprising an insulating material located in the spaces.

29. (Canceled)

30. The display system of claim 1 wherein the nonlinear elements comprise Schottky diodes.

31. The display system of claim 1 wherein the nonlinear elements comprise PN diodes.

32. The display system of claim 1 wherein the nonlinear elements comprise varistors.

33. The display system of claim 1 wherein the nonlinear elements comprise silicon films formed from silicide salt.

34. The display system of claim 1 wherein the nonlinear elements comprise a polymer conductor.